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MULTIFUNCTIONAL WORK UNIT EVALUATION: FINAL REPORT

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Final Report

on

MULTIFUNCTIONAL WORK UNIT EVALUATION

Prepared for the

ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION

UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

by

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SECTION I - INTRODUCTION

This study has three objectives: (1) evaluation of effectiveness of multifunctional (MF) work units as an organizational structure, (2) identification of organizational and personnel problems associated with this structure, and (3) evaluation of alternative approaches and procedures for improved effectiveness. The results related to each of these objectives are presented in Sections III, IV, and V respectively. The approach used in the study is described in Section II.

There is a growing awareness of the interdisciplinary nature of many, if not most, of our natural resource management problems. Organizing research effort for an effective response to these problems is a complex challenge for researchers. Although there is considerable experience with task groups in the industrial sector, there is only limited documented analysis of team research in government and university institutions. At first glance it would appear that team research is antithetical to creative solutions of problems. The general wisdom is that any constraint, such as those required for truly effective team efforts, is counterproductive to creative research. Recent work by Pelz and colleagues (1975) suggests that complete autonomy of a scientist is not necessarily the most productive environment. Rather, an environment of "creative tensions" between strong security and strong challenge is most conducive to creative problem solving. If Pelz et al. are correct then an exciting possibility exists in using the interdisciplinary team approach as one method to provide the challenge and manage the "creative tensions."

Recent research by the investigators (Benton et al., 1977) at Colorado State University suggest that there is some validity to the hypothesis of challenge and creative tensions as applied to interdisciplinary research in the university setting. In spite of many organizational and personal difficulties, the 76 scientists involved were very positive on the prospects for future participation in such research and the projects themselves resulted in significant contributions to science in general and University goals in particular. Much of the approach used and many of the operating assumptions for this Forest Service study are an outgrowth of the study at Colorado State University funded by the National Science Foundation.

SECTION II - STUDY APPROACH

Five projects were selected by the investigators and the Deputy Director of the Rocky Mountain Forest and Range Experiment Station. Three of the projects were multifunctional, one was multidisciplinary but unifunctional, and one was unidisciplinary and unifunctional. Some significant characteristics of these projects are presented in Table 1. The professional members of these projects were interviewed individually. Each member, including the project leader, was also asked to respond to a brief written questionnaire evaluating the percentage effort and progress on four general categories of effort or tasks (Appendix 2). All individuals were assured of the confidentiality of their responses. The objectives of the study are aimed at organizational improvement and not evaluation of individuals.

Table 1. Project Characteristics

Project	Number of Professionals Responding	Date Started	Type of Project [1/]
1251	4	1974	MF, MD
1710	5		UF, MD
1751	4	1974	MF, MD
1752	7	1974	MF, MD
2201	3		UF, UD
Total	23		

[1/] MF = multifunctional, MD = multidisciplinary
UF = unifunctional, UD = unidisciplinary

The study does involve evaluation of project effectiveness and thus some indicators of effectiveness were required. In the NSF study, referred to in the introduction, a comparison was made between a self evaluation by project leaders and project staff with an evaluation by an external panel provided with all the documentation of progress available from the projects studied. Results from that study indicated very close agreement between internal self ratings and external ratings. Utilization of publications or other quantifiable output parameters was considered and rejected based on several factors: (1) short duration of the multifunctional units (~3 years), (2) large shifting of personnel in and out of projects during the three years, and (3) diverse emphasis on different types and time frames of research activity. Thus, only a subjective measure of effectiveness is used but past experience with this approach along with the importance of perceptions of effectiveness to actual effectiveness by research scientists is believed to justify this approach for the objectives of this study.

The second objective of the study is to identify problems. Input for this objective is obtained primarily from the interviews with project personnel and especially from the project leaders. Some written input is obtained from the responses in the open-ended part of the questionnaire but this is relatively minor compared to that obtained during the interview.

The responses from Part B of the questionnaire are designed to obtain information on problems that might be associated with the multifunctional units. Previous studies indicate the following key

factors in successful multidisciplinary projects:

(1) Competent, motivated scientists

(2) Team orientation carefully orchestrated by the project leader

(3) Leadership with a keen balance of firmness and flexibility

(4) Continual, frequent and open communication

(5) Perception by project scientists of strong support by the organization

The questions in Part B of the questionnaire zero in on the degree these elements are present in the projects studied.

The approach to the third objective, improving the effectiveness of multidisciplinary research, is to use the workshop as a problem solving mechanism. This mode is chosen because it involves those best able to solve the problems and serves as a commitment-building device for the solutions generated. Input for this objective is all the information collected during the study as synthesized in Sections III and IV of this report.

SECTION III - RESULTS

Project Leader Evaluations of Project

Each of the five project leaders was asked to estimate percentage of effort and rate progress on four general criteria as listed in Table 2. The objective of this process was to obtain the project leaders' perception of progress of the project in terms that could be compared across projects. This process results in a score for each project obtained by weight averaging the percentage effort and progress ratings. Past research involving comparisons of such internal evaluation with that from an external panel indicated very close agreement (Benton et al., 1977). Ranking of projects by effectiveness permits comparison of certain management characteristics with effectiveness.

Project leaders were also asked how the percentage effort should be distributed as compared to how it actually is. These results are presented in Table 3.

Several important findings are evident from the data presented in Tables 2 and 3. The multifunctional project leaders believed they were making only slightly better than average progress. All MF projects had a relatively high (50% or greater) percentage of efforts aimed at response capability to future problems (intermediate to long term time frames). All three multifunctional leaders believed they should reduce the project effort expended on immediate, short-term problem resolution. On the other hand, only one of the three multifunctional project leaders thought that there was any unbalance in efforts on innovation or dissemination.

Table 2. Summary of Project Leaders' Self Evaluation on Projects - Percentage Effort and Rating of Progress[1/]

	A Continually develop and refine knowledge of natural resource systems and increase competency of researchers of these systems to insure response capability to future resource management problems		B Respond to immediate (short-run) natural resource problems		C Innovation - exploration of new techniques of measure-ment or management of natural resource systems		D Dissemination of results to users other than fellow researchers	
Projects	%	Score	%	Score	%	Score	%	Score
1MF[2/]	50	5.0	40	2.0	5	6.0	5	4.0
2MF	70	3.0	10	1.0	10	3.0	10	4.0
3	70	1.5	5	2.0	15	2.0	10	1.0
4MF	50	3.5	30	3.0	10	2.0	10	2.0
5	25	4.5	60	3.5	5	6.0	10	4.5

[1/] Progress rating: 1 = very good progress, 4 = average progress, 7 = very poor progress

[2/] MF = multifunctional project

Table 3. Suggested Changes in Emphasis on Project Tasks (Change in Percentage from that Indicated in Table 1).

	A Continually develop and refine knowledge of natural resource systems and increase competency of researchers of these systems to insure response capability to future resource management problems	B Respond to immediate natural resource problems	C Innovation - exploration of new techniques of measure-ment or management of natural resource systems	D Dissemination of results to users other than fellow researchers
Projects				
1MF[1/]	0	-30	+25	+5
2MF	+10	-10	0	0
3	0	0	0	0
4MF	+20	-20	0	0
5	+1-	-20	+ 5	+5

The management/organizational problems that project leaders associated with these effectiveness evaluations are presented as issues in the following section of this report.

Project Professionals' Responses

A summary of the responses from the professionals on the five projects is presented as Table 4. These responses relate to both project effectiveness and management characteristics.

Effectiveness can be judged from the responses to the ratings of progress toward project goals (Problems) in Part A, and individual assessment of how participation on a multifunctional unit affects their research effectiveness (Question B-1)

The rating on progress on the major problems averaged for the three multifunctional projects was 3.5 with a range from 2.9 to 3.9. Thus, the professionals on the multifunctional projects thought they were making close to average progress. These averages weighted the problems equally; there was considerable variation in ratings within a project on the individual problems.

An interesting comparison is the rating that project leaders gave their projects based on the parameters in Table 2 and the average rating of all project personnel including the project leader on progress on problems. These are presented below:

Project	Project Leader Rating	Professionals Rating
1	3.8	3.8
2	2.9	3.9
4	3.0	2.9

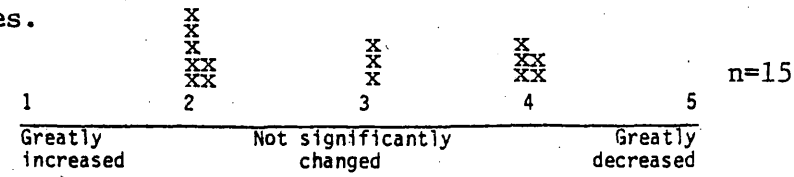
Table 4. Responses of individuals on the multifunctional projects and means for the multifunctional and unifunctional projects. The n value refers to the multifunctional responses.

Part B: Questions on effectiveness and management.

1. How do you believe your research effectiveness is (or would be) influenced by participation on a multidisciplinary team?

Comments:

MF mean = 3.0
UF mean = 2.7

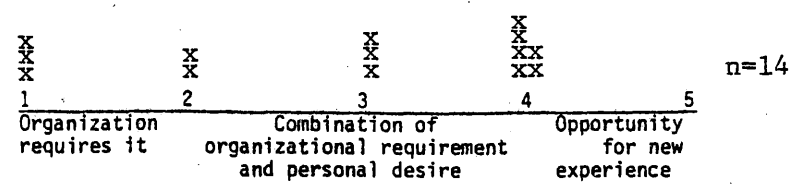


n=15

2. What is (or would be) the primary motivation for your participation on a multidisciplinary team?

Comments:

MF = 2.8
UF = 3.1

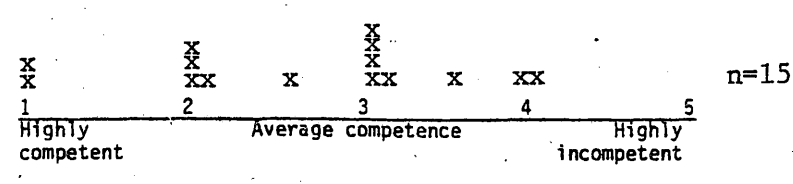


n=14

3. How would you rate the overall competence of the other professionals on your project compared to other Forest Service projects?

Comments:

MF = 2.6
UF = 1.6

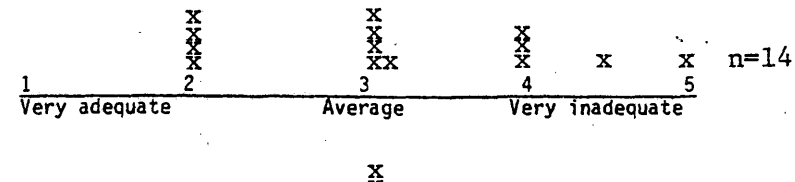


n=15

4. How would you rate communications between professionals on the project as they relate to project effectiveness?

Comments:

MF = 3.0
UF = 2.8

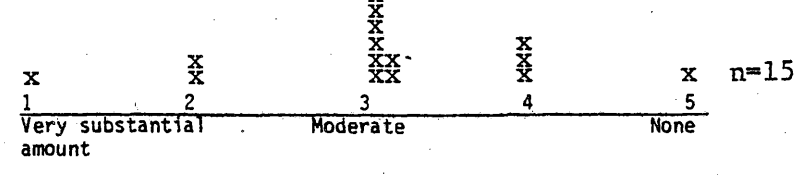


n=14

5. How much cooperative teamwork is present?

Comments:

MF = 3.0
UF = 2.4

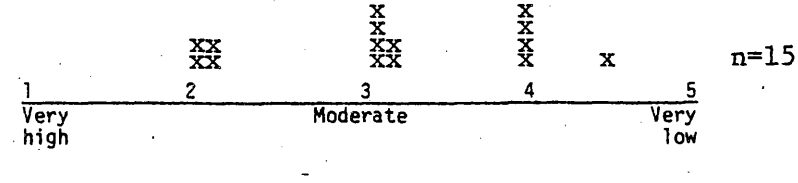


n=15

6. How would you rate the degree of commitment to the project goals by the project professionals?

Comments:

MF = 3.1
UF = 1.8

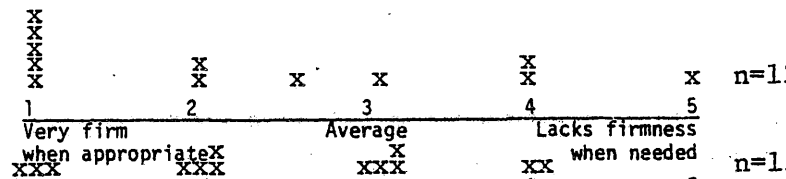


n=15

7. How would you rate your project leader on the following dimensions:

a. Firmness in requiring accomplishment of specific tasks?

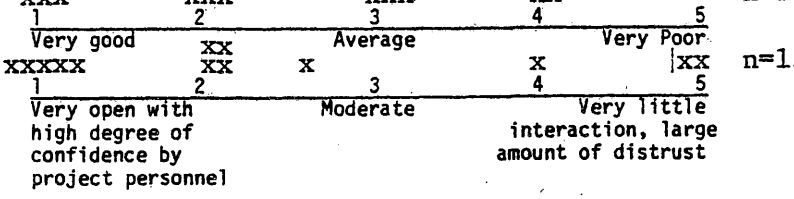
MF = 2.8 UF = 2.8



n=12

b. Flexibility in recognizing individual capabilities and preferences?

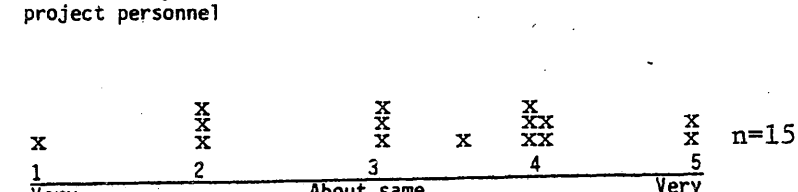
MF = 2.4 UF = 1.3



n=13

c. Openess and trust in relations with project professionals?

MF = 2.3 UF = 1.3



n=13

Comments:

8. How do you believe participation in a multifunctional unit affects your career and professional status?

MF = 3.3
UF = 2.5

Comments:

n=15

9. How do you personally feel about participation in a multifunctional, multidisciplinary team?

   a. Prefer to work on MD project(s) for a limited time then return to traditional monodisciplinary project(s).

      MF = 3.5 UF = 2.5

   b. Prefer to work part-time on MD project(s) if I could maintain a professional "home" and some research with a group in my own discipline.

      MF = 2.8 UF = 1.9

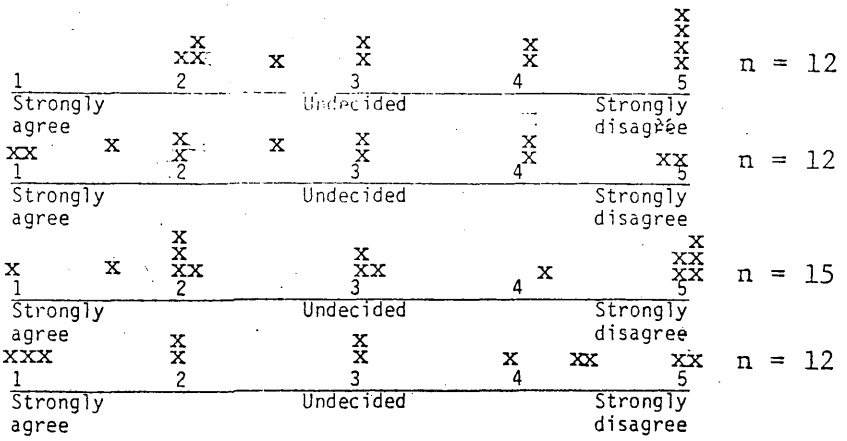
   c. Prefer to work full-time and long-term on MD projects.

      MF = 3.2 UF = 4.2

   d. Prefer to work full-time and long-term on monodisciplinary projects.

      MF = 3.2 UF = 3.2

Comments:



The summary for the multifunctional project responses to the questions in Part B are presented in Table 4. The mean value for question number 1 on research effectiveness was 3.0, "not significantly changed." The range of the three projects averages was 2.6 to 3.5.

There was somewhat greater spread in the response to question number 8 on the perceived impact on career and professional status with a mean value of 3.3 or slightly negative impact. The spread of the averages of the three projects was 3.0 to 3.5. Particularly significant on this question is the spread in the individual responses from 1 to 5.

Motivation for participation on multidisciplinary teams, question number 2, appears to be a mixture of organizational requirement and personal desire. The project with the highest rating by the professionals had a 2.5 average, the other two had mean average responses of 3.0.

Competence, question number 3, was judged to be slightly above average (2.6) with an average spread from 2.0 to 3.3 with the projects aligning in direct relation to perceived effectiveness by project personnel.

Responses from the multifunctional units to question number 4 on communications resulted in a mean value of 3.0 with the lower effectiveness project receiving a 4.2 and the other two projects receiving a 2.7 and a 2.2.

Question number 5 on teamwork gave a 3.1 mean with a spread from 2.2 to 3.7. The least effective project received the 3.7.

The degree of commitment as measured by question number 6 indicated only a moderate response (3.1) with the least effective project receiving a 3.7 and the other two projects receiving a 2.5 and a 2.7.

Apparently all multifunctional personnel perceived above average leadership characteristics. Only one project rating on firmness was slightly below average (3.2).

There is no clear preference by the project professionals as a group on their preferred mode of participating on MF projects. The most striking feature of the answers to question number 9 is the wide diversity in the answers. Only 4 out of 12 responded favorably to the idea of working for a limited time on multifunctional team and 6 out of 12 to the idea of part-time participation. There was a much more favorable response to these ideas from the professionals on the unifunctional projects. Only 6 out of 15 professionals in the MF projects preferred to work full-time and long-term on multidisciplinary projects. Perhaps the best summary of these results is given in the response of one of the multifunctional project staff when he replied, "it all depends on the project, project leaders, and other people on the project."

Open-ended Comments

There were 42 open-ended comments from the multifunctional units in Parts B and C of the questionnaire. These items are listed in order of frequency of occurance in Table 5.

Table 5. Open-ended Comments from the Multifunctional Projects

Subject	Frequency Mentioned
Inadequate Problem Statements	14
Inadequate Staffing	10
Poor Communications/Interaction	5
Poor Technician Deployment	5
Poor Support Services	2
Poor Study Design	2
Personality Conflicts	2
Poor Overall Direction	2

SECTION IV - IDENTIFICATION OF PROBLEMS: ISSUES FOR THE WORKSHOP

Based upon both the written response and the individual discussions with project personnel, a series of issues related to multifunctional research units are presented in this section. Although most of the ideas came from project personnel, the authors of this report are responsible for the way the ideas are organized and expressed. These issues are suggested for consideration at the workshop involving project leaders and station directorate. The analysis of results purposely is presented in the previous section, separate from the issues, to encourage individuals to interpret the data themselves as it might relate to the issues. The anticipated outcome from the workshop is a series of creative solutions for the issues raised.

ISSUE # 1 - What are the criteria for forming a multifunctional unit?

The specific role of a MF unit does not appear to be clear. Unifunctional, multidisciplinary units or cooperative agreements between projects can play much the same role as a MF unit. When and to what extent is it necessary or desirable to form a MF unit? Are there any viable alternatives to this approach which will do as good or better a job of meeting the criteria? Is the multiproject approach a viable alternative?

ISSUE # 2 - Is there proper problem definition of research problems?

Intimately related to the issue of criteria for multifunctional units is the formulation of project problem statements. There is concern that these are often not realistic statements of what the

project is really capable of achieving and a criticism that these are too "top-down" directed. What is the real role of problem statements and what is the best approach to their formulation?

ISSUE #3 - What is the optimum size for a multifunctional unit?

Some feel that to be truly of value a multifunctional unit must contain a critical mass of different disciplines, synthesis capability, and support staff facilities. Furthermore because this type of activity requires considerable management skill and time, it is argued that it would be more efficient to have larger projects (10 or 12 people) and have the leader concentrate his efforts on project management. The contrary argument from some is that a small (4 to 6) group is much easier to manage and the project leader can still function as a researcher. Is a compromise solution of a few, large, well-funded projects with flexible task groups a workable compromise? Are there other alternatives?

ISSUE #4 - How long should a scientist be assigned to a multifunctional unit?

Project personnel generally were undecided about the appropriate length of time to serve in a multifunctional unit. (See Section III, Question 9 results.) These results may be an indication of improper selection of personnel for the multifunctional units studied but it could be a general feeling of research scientists who need the security of a discipline "home." The length of the project itself depends on the nature and scope of its objectives. There is considerable flexibility possible however in the duration that any one person needs to be assigned, and in some cases persons of the same discipline but with different skills may be required.

ISSUE #5 - Is there adequate Washington Office support for multi-functional units?

Should there be an individual in the Washington Office directly responsible for multifunctional units with equal status to functional staff officers? The argument for this stems from a strong feeling on the part of some multifunctional project leaders and project staff that they do not receive the same amount of top level support as traditional functional projects. There is some question as to how adequately a person with functional responsibility can really champion multifunctional projects no matter how well intentioned such efforts may be.

ISSUE #6 - Should there be special preparation for participation in multidisciplinary projects?

To what extent should deliberate well-planned, specialized training be provided for scientists and project leaders before assignment to multidisciplinary projects? Should station directorate participate in some of these sessions to be more sensitive to inherent problems and convey strong support to those who will be involved? Is continued training in such areas as team building, conflict resolution, and communications required?

ISSUE #7 - Should project leaders be given greater flexibility and discretion in managing mutlidisciplinary projects?

These projects require a special kind of people not only in technical capability but also in personality traits. Furthermore, a "misfit" is much more detrimental in this kind of project and harder to "isolate" than in a traditional unifunctional setting. Therefore, project leaders may need to have a much greater voice in personnel selection and transfer decisions.

ISSUE #8 - Is there an adequate reward system for participation in multifunctional units?

The nature of the research products from multidisciplinary efforts often make it difficult to identify an individual's contribution. Does the panel review system in particular and the reward system in general respond to this difficulty?

SECTION V - RECOMMENDATIONS FOR IMPROVED EFFECTIVENESS

There are several potential and partial solutions to the problems and issues identified. Each of these should be put to pragmatic tests and continually revised. Above all, it is important that communication takes place among the individuals and levels of the organization involved. One possibility for the Station to consider is the examination of alternative organization structures.

Alternative Organization Structures

There are many ways that multidisciplinary research can be organized. Multidisciplinary research can take place and is taking place in a unifunctional setting. In some instances, multidisciplinary research may not be taking place in the multifunctional setting. It therefore seems desirable to find an organization structure which lends itself best to the flexibility needed by project leaders and other project personnel and at the same time allows for accountability to the Station Director and is acceptable research within a discipline.

A vertical structure would allow for the accountability within the hierarchy of the station. Unfortunately, such a structure puts a great deal of responsibility on the Assistant Directors to know the value of research in quite different disciplines.

A functional or discipline orientation allows for good research within a discipline but often does not respond to user problems and may not allow for the accountability that is necessary within the hierarchy. On the other hand, product organization organized around user groups is probably too product specific for the present needs of the station engaged in creation of knowledge for long-range as well as short-range problem-solving.

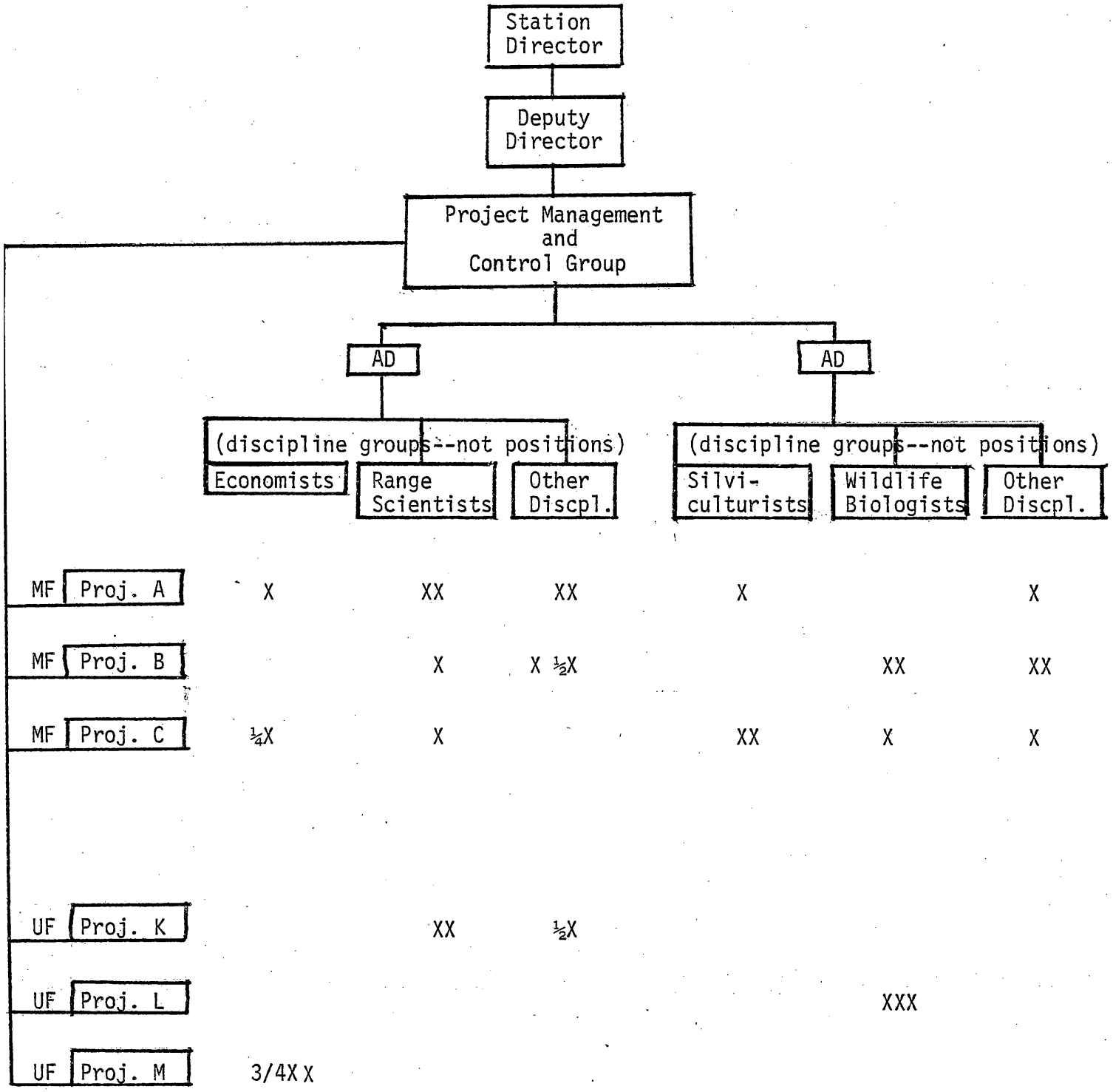
A project organization without supervision between project and Director levels, creates a very large span of management and does not necessarily allow for transfer of knowledge between projects. The matrix organization structure shown in Figure 1 has the advantages of each of the other models and if properly implemented minimizes the major disadvantage of mixing organization structures: i.e., the professional scientist ("X") potentially having two bosses. If, one of those bosses is an administrative head (as the Assistant Directors would be here), and if the other boss is a task-leader (as the project leaders would be here), then the negative impact of the structure is diminished.

The major advantages include opportunities for effective research in both monodisciplinary and interdisciplinary modes, centralization of control and other aspects of management at appropriate levels, less coordination time and acceleration of future manager development. By definition, the internal organization is more complex and greater responsibilities are placed on individuals than in other types of organizations. Nevertheless, the potential for increased but reasonable span of management and unity of command/direction are assets.

The specific organization show in Figure 1 has several other major advantages: the Assistant Directors have less direct involvement with the projects and more involvement with all professional personnel which enables the ADs to become the champions of disciplines and professional personnel interests (vis-a-vis project personnel interests). The project leaders (especially the MF project leaders) on the other hand, could be more independent and directly responsible

FIGURE 1

Matrix Organization



X = Professional Scientist

in operating and leading their projects. These concepts reemphasize and reinforce the idea that the home for the professionals is at least the station (if not the Forest Service), championed by an Assistant Director, not the project. Further, such organization would make it possible for professionals to serve on more than one project.

We believe the recommended alternative organization will make it much easier for the project leaders to lead, and for the Assistant Directors to plan for personnel decisions. These ends may be accomplished under the present organization structure but it seems important that more aggressive management and leadership responsibilities be exerted respectively by the Assistant Directors and project leaders.

Combining Projects

Another change in the organization would be to combine efforts of the two MF units located at Fort Collins to provide a better mix of needed disciplines working together. This could be achieved by cooperative arrangements between the two projects or by actually combining the projects into one. Considering the disruptions that have already occurred it is not recommended that this combination be implemented unless the project personnel are highly supportive.

Workshop Involving Multidisciplinary Project Professionals

Throughout this study, there was a great amount of interest by project personnel in making MF units work better. It is recommended that a workshop involving these personnel would accomplish the following: (1) serve as a communication and reinforcement mechanism stressing the importance and support of MF units by the station,

(2) allow project personnel, project leaders, and station directorate to work together on refinement of project objectives (problem statements), (3) provide a mechanism whereby individuals could meet together with others in their discipline on MF units to discuss common problems and possible training needs, (4) serve as a mechanism to solicit ideas for improvement including how closer ties might be established between units, and (5) provide an opportunity for some sessions on team building, communications, and conflict resolution.

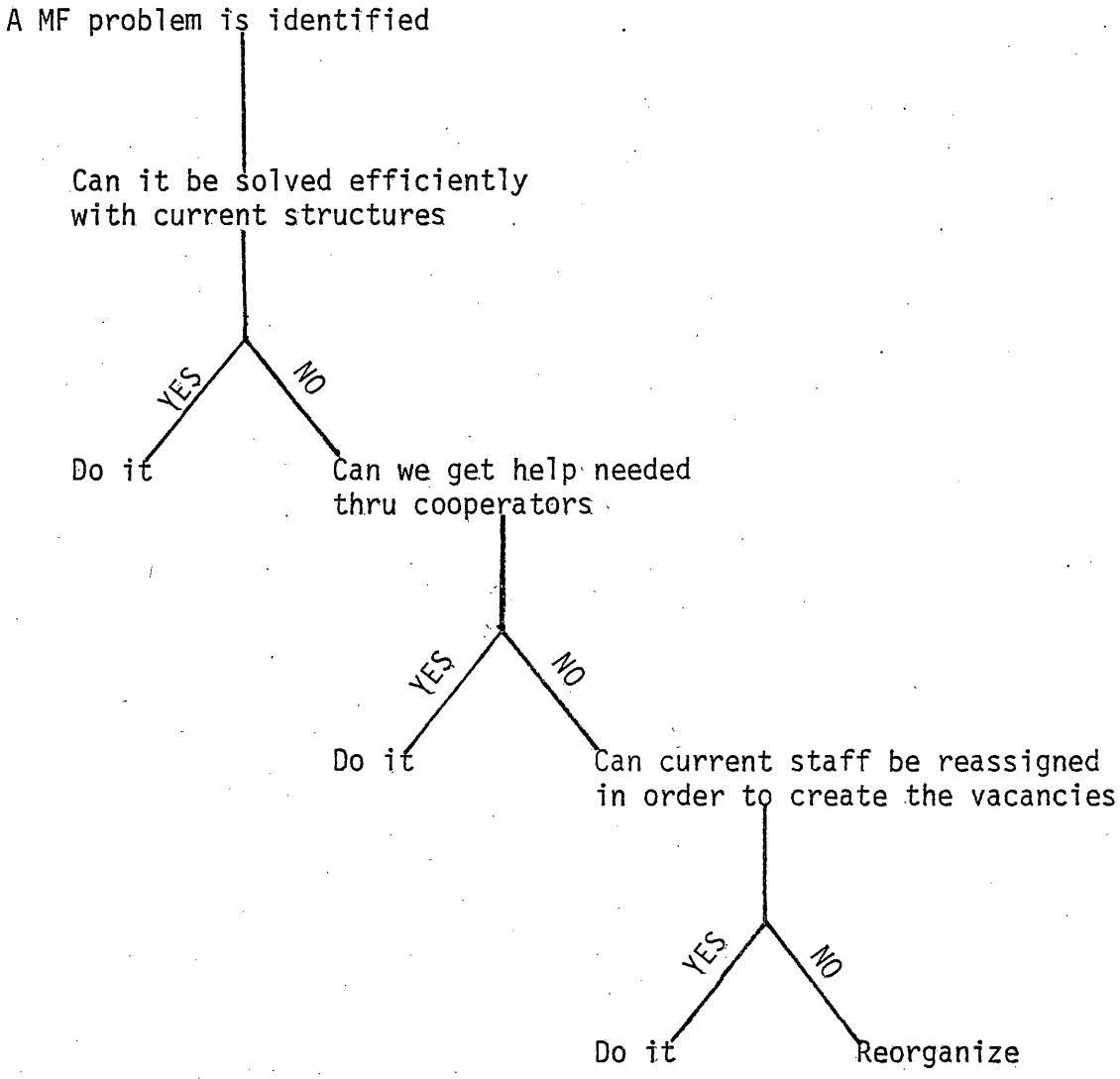
Criteria for Forming Multifunctional Units

Criteria for multifunctional units remain a major issue and can be at least partially solved by assuring that at least one of the following conditions are present when setting up multifunctional units: (1) the unit is problem-solving on multidisciplinary problems, (2) there is a pooling of resources for multidisciplinary research, or (3) there is an efficiency of leadership and/or support facilities to be gained by forming a multifunctional unit. In addition, there are several personnel issues that must be considered in forming a MF unit: personnel availability, their potential commitment to MF units and their adequate utilization. These considerations relate to both alternative organization structures, adequate problem definition, and basic personnel decisions discussed elsewhere in this section. Figure 2 shows one possible flowchart for MF work unit formation.

Emphasis should be placed on explaining these conditions and the importance of multifunctional units to all participants. A joint workshop involving the MF unit professionals would accomplish this objective as well as others.

Figure 2

Flowchart for Multifunctional Work Unit Formation



Problem Definition

The problem of adequate definition of research objectives is one of specificity. In addition, the degree of participation in setting and commitment of station personnel to the problem statements and objectives should be considered. If project personnel have not been involved sufficiently in defining project objectives (and we believe there is evidence that they have not), they cannot be fully committed to project objectives. The project leaders need to involve project personnel in the problem definition process. The process need not be an elaborate one and it need not take extensive amounts of time but it is important that all project personnel participate in the setting of project objectives. The suggested workshop would help implement this recommendation.

Obviously if the project objectives and problem statements are not specific, then any performance will do. The need, therefore, is to define the objectives in such a way that technical skills can be aimed at accomplishing some specific end. Performance objectives must meet at least the following three criteria:

(1) state outcomes expected of personnel within a given time frame;

(2) under what conditions -- restrictions, given time limits, etc. personnel are to perform their task; and

(3) must be measurable so that accomplishment can be evaluated.

If a work unit does not have specifically directed objectives or problem statements, then there is no way that they can know whether they are directing their efforts along the proper lines or whether they can be measured or evaluated.

Human Resources Decisions

Based on the responses to question #9 (Table 4), there is not a good match between people and jobs on the projects. Proper matching of jobs and personnel is important in all organizations. It becomes especially important in a MF unit performing multidisciplinary tasks where the personnel must operate as a team. Attention has to be given to recruiting and selecting individuals who want to work as a team.

Even greater attention must be given to the selection of the project leader of a multifunctional unit than the normal project leader, who must exhibit a desire for leadership and an ability to manage. These traits, especially team building skills, become even more important for the multifunctional unit where the management time and skill requirements are greater than in the normal unifunctional project.

Committed, motivated people can make a project effective despite other drawbacks in the organizational environment. To obtain this type of commitment requires a high degree of teamwork and reinforced successes.

Teambuilding sessions within MF units and other types of training, including technical training within disciplines, are needed. These team building efforts can in themselves be motivating situations, but motivation is a self-inspired concept. It is important for the organization and individual project leaders to create a motivating environment. Simply stated, this means that an environment must be created wherein the individual needs of the people working on the project are satisfied.

Project Leadership

Although the project professionals including the project leaders rated communications above average (Table 4), there was discussion at the Estes Park workshop that there may not always be sufficient consultation of project leaders on key project and personnel decisions. It was understood, however, that there is an important distinction between consultation and ultimate or final decision-making authority.

To assist the project leader in creating a desirable managerial environment, it is important that the project leader have the flexibility and discretion necessary to make project decisions such as problem definition. The project leader must, in turn, exercise the authority and responsibility to make these decisions. This means the project leader must take an active role in arbitrating the needs of professional scientists, and the overall research needs of the Forest Service. It also means that the station directorate must direct the project and to take corrective action where needed. Further, it is necessary for the project leader to have organization integrity, i.e., that he not be bypassed or excluded from important personnel and other decisions. These concepts are even more important under the alternative organization structure proposed above because of the potential misunderstandings that might arise about personnel responsibilities.

Communications

There are some difficulties with open communications between levels within the station. The necessity for open communications and a climate of mutual respect and trust cannot be overemphasized. To be sure, open communications can be overdone if carried to the

extreme in that communicating everything can waste a great amount of time as well as have a harmful effect if some matters are better left unsaid. But in dealing with professionals, failure to communicate feelings and sentiments and to develop openness in these communications, can have even more harmful effects. Thus, there is a necessity to engage in frequent interactions and open communications which may be enhanced by training.

The efforts of the top management within the station to communicate, to see and to be seen by project leaders is a helpful measure. This accessability and availability to other project personnel can be extended without interfering with the organizational integrity of the project leader (the phenomenon is seen more as a means of openness in communications rather than as a decision making process). Similarly, the interactions that took place at the Estes Park meeting are indicative of the types of open communication desirable in an organization. Any good, professional organization will have some degree of professional conflict -- especially on research matters requiring inquiry but also on management matters.

The project leader has some responsibility for mediating conflict by laying the groundwork for meetings between parties, by helping the parties define the issues and by facilitating communications. As noted above, it is important that creative tensions take place but it is incumbent upon the project leader to manage the tension levels and to supplement others' skills in the organization with managerial problem-solving skills.

Interdisciplinary Output Measurement/Evaluation

It was not possible at this time to evaluate the projects by other than self-evaluation questions. This is because the units are only now really moving into multidisciplinary efforts with a stable personnel mix. However, we recommend that an evaluation of the products from the MF units be evaluated in about two years from now. This evaluation should also include asking the same questions used in the current study.

REFERENCES

Douglas A. Benton, James R. Meiman, Daryl B. Simons, Douglas D. Sjogren, Donald C. Taylor, Morton McPhail; 1977, Organization and Personnel Management for Effective Interdisciplinary Research Projects. 327 pages.

Donald C. Pelz; 1975, Organizing the Organization for Better R & D. 45 pages.

APPENDICES

APPENDIX I Questionnaire

APPENDIX II Goals/Tasks

ROCKY MOUNTAIN FOREST AND
RANGE EXPERIMENT STATION

Survey Instrument for Project
Professionals

Project Number 1710

Years on project since project began
in 19_____

This instrument is part of a study aimed at improving the capability of the RMFRES to respond to research problems. The following set of questions is designed to get your ideas on the productivity and management of multifunctional and/or multidisciplinary projects. "Multifunctional" projects have more than one source of line item funding; "multidisciplinary" projects have scientists from two or more traditional disciplines. They may be multifunctional or unifunctional.

All replys will be confidential and results presented only in aggregated statistics. You are encouraged to express ideas not covered by the questionnaire by adding them in written form or verbally in the individual interviews to follow. Please return your reply either in person or by mail to: Jim Meiman, Rocky Mountain Forest and Range Experiment Station, Fort Collins.

The instrument consists of three parts:

A. Evaluation of progress and related management characteristics.

Please rate progress toward solution of the following problems. Also include any observations on management/organizational variables that either help or hinder accomplishment. Finally, list any suggestions you have regarding the best measures of productivity to use for evaluation of progress on each problem.

B. Questions on effectiveness and management.

C. Open-ended questions.

Part A: Evaluation of progress and related management characteristics.

1. Problem Statement # 1 :

Lack of specific guidelines for qualitatively classifying mule deer and elk habitats in ponderosa pine, mixed conifer, and pinyon-juniper types.

2. Evaluation of Progress:

1	2	3	4	5	6	7
Very good progress			Average progress			Very poor progress

3. Management/organizational variables contributing to or hindering progress:

4. Suggested evaluation measures:

1. Problem Statement # 2 :

Inadequate guidelines for qualitatively classifying small-game and nongame bird habitats in ponderosa pine and mixed conifer forests.

2. Evaluation of Progress:

1	2	3	4	5	6	7
Very good progress			Average progress			Very poor progress

3. Management/organizational variables contributing to or hindering progress:

4. Suggested evaluation measures:

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1. Problem Statement # 3 :

Lack of information necessary to restore and maintain habitats for endangered or threatened wildlife on southwestern forests and rangelands.

2. Evaluation of Progress:

1	2	3	4	5	6	7
Very good progress			Average progress			Very poor progress

3. Management/organizational variables contributing to or hindering progress:

4. Suggested evaluation measures:

Part B: Questions on effectiveness and management.

1. How do you believe your research effectiveness is (or would be) influenced by participation on a multidisciplinary team?

1	2	3	4	5
Greatly increased		Not significantly changed		Greatly decreased

Comments:

2. What is (or would be) the primary motivation for your participation on a multidisciplinary team?

1	2	3	4	5
Organization requires it		Combination of organizational requirement and personal desire		Opportunity for new experience

Comments:

3. How would you rate the overall competence of the other professionals on your project compared to other Forest Service projects?

1	2	3	4	5
Highly competent		Average competence		Highly incompetent

Comments:

4. How would you rate communications between professionals on the project as they relate to project effectiveness?

1	2	3	4	5
Very adequate		Average		Very inadequate

Comments:

5. How much cooperative teamwork is present?

1	2	3	4	5
Very substantial amount		Moderate		None

Comments:

6. How would you rate the degree of commitment to the project goals by the project professionals?

1	2	3	4	5
Very high		Moderate		Very low

Comments:

7. How would you rate your project leader on the following dimensions:

   a. Firmness in requiring accomplishment of specific tasks?

1	2	3	4	5
Very firm when appropriate		Average		Lacks firmness when needed

   b. Flexibility in recognizing individual capabilities and preferences?

1	2	3	4	5
Very good		Average		Very Poor

   c. Openess and trust in relations with project professionals?

1	2	3	4	5
Very open with high degree of confidence by project personnel		Moderate		Very little interaction, large amount of distrust

Comments:

8. How do you believe participation in a multifunctional unit affects your career and professional status?

1	2	3	4	5
Very positively		About same as non-MF project		Very negatively

Comments:

9. How do you personally feel about participation in a multifunctional, multidisciplinary team?

	1	2	3	4	5
a. Prefer to work on MD project(s) for a limited time then return to traditional monodisciplinary project(s).	Strongly agree		Undecided		Strongly disagree
b. Prefer to work part-time on MD project(s) if I could maintain a professional "home" and some research with a group in my own discipline.	Strongly agree		Undecided		Strongly disagree
c. Prefer to work full-time and long-term on MD projects.	Strongly agree		Undecided		Strongly disagree
d. Prefer to work full-time and long-term on monodisciplinary projects.	Strongly agree		Undecided		Strongly disagree

Comments:

Part C: Open-ended questions.

1. How do you think the Forest Service should handle multidisciplinary research problems?

2. What do you think are the best measures of productivity for you as an individual on this project?

APPENDIX II

In-progress Measures

Goals/Tasks	Measures
A. Continually develop and refine knowledge of natural resource systems and increase competency of researchers of these systems to insure response capability to future resource management problems.	1. Relationship of research to long-term requirements of National Emphasis Programs and regional needs analyses. 2. Publications - especially those of fundamental nature; emphasis on refereed and basis journals aimed primarily at fellow researchers. 3. Professional status of researchers as indicated by awards, national committees, journal editorships, and similar types of recognition.
B. Respond to immediate natural resource problems.	1. Relationship of research to immediate requirements identified in National Emphasis and regional needs documents.
C. Innovation - exploration of new techniques of measurement or management of natural resource systems.	1. New ideas
D. Dissemination of results to users other than fellow researchers.	1. Publications aimed primarily at managers; bulletins, guides, etc. 2. Evidence of use of research in management (or plans for such use). 3. Demonstrations, workshops, one-on-one contacts with managers.

MD Considerations	Percentage Effort Existing	Percentage Effort Desired	Rating of Progress (1 = very good to 7 = very poor)
(1) Synthesis needs and response thereto. (2) Synthesis articles involving interrelationships between systems (3) Recognition by more than one discipline; e.g. joint committees, synthesis journals.			
(1) Synthesis needs and response thereto. (2) Material covers more than one resource system.			
(1) Innovation involves application to two or more natural resource systems.			
(1) Dissemination to management staff from more than one natural resource system.			